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13 March 1981

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

(FOUO 5/81)



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WORLDWIDE REPORT
NUCLEAR DEVELOPMENT AND PROLIFERATION
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WORLDWIDE AFFAIRS

BRIEFS

NUCLEAR COOPERATION INCREASE--Franco-Algerian nuclear cooperation is increasing. Algeria will order two nuclear reactors from France and send some trainees to study at the Centre de l'Energie Atomique [Center for Atomic Energy]. [Text] [Paris PARIS MATCH in French 27 Feb 81 p 43]

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JAPAN

AUTOMATIC CHECKING OF NUCLEAR POWER PLANTS DEVELOPED

Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 49

[Text] In an effort to shorten the time necessary, reduce exposure to radiation, and save labor for regular inspections of nuclear power stations, much work has been done to automate inspection equipment. Typical equipment for BWR's which Hitachi Ltd. has prepared is as follows:

(1) Automatic Fuel Exchanger

Fig. 1 shows a block diagram of an automated remote system for fuel exchanging. The system has three different operational modes: automatic; remote manual; direct manual. With "automatic" mode, a complete cycle of operations (Z-upward, XY-travelling, θ -rotation, Z-downward) are executed continuously and automatically. A thyristor Leonard speed controller performs XYZ speed control according to the pattern calculated by a computer. The repetitive accuracy of overall positioning of the fuel is $\pm 10\text{mm}$ or less (17m downward). In addition to the safety measures provided by a variety of hardware, the computer provides various monitoring functions with an alarm output for any abnormality, as well as logging of job records. The advantages of this automatic fuel exchanger over conventional ones are:

- (1) Automotive operation can be effected by a single worker remotely from a control room;
- (2) The working time is shortened by 30-40% compared with that of current methods;
- (3) Additional safety for handling nuclear fuels are provided by both hardware and software.

(2) In-service Inspection Equipment

A remote, and semiautomatic ultrasonic flaw detector is illustrated in Fig. 2. The equipment consists of a probe unit, a data recorder, and data processor. The probe unit is set on the site and the data recorder is connected by a cable, while the data processing unit deals with information to be recorded off-line.

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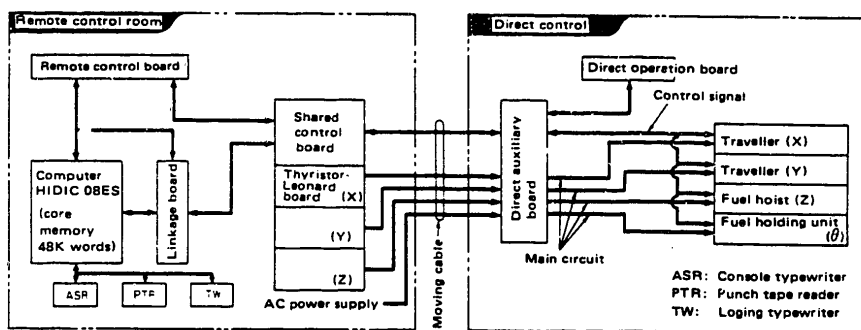


Fig. 1. Automatic Fuel Exchanger

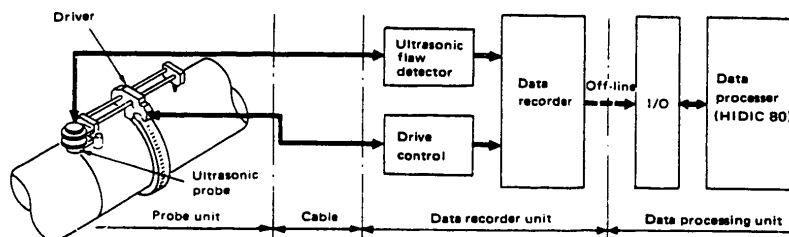


Fig. 2. Remote and Semiautomatic Ultrasonic Flaw Detector

(1) Ultrasonic probe

For the ultrasonic probe, a multiprobe which houses a standard and angle probes in the same casing is mainly used, and moreover, three angles (0° , 45° , 60°) of detection are available.

The probe driving mechanism for inspecting pressure vessels provides for longitudinal and peripheral weld lines. Along the weld lines, vertical and peripheral orbits are provided for by a turn table on their intersection. The driving unit travels between the orbits and the body for probe scanning.

(3) Data recording unit

The data recorder stores flaw inspection data, such as probe location signals and the pulse height plus the path length of the indications etc., in a floppy disk. The data recording portion incorporates a controller to govern the probe driving unit; an image display panel to convert detection results into cross-sectional, or projected pictures; and other indications.

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The following are the features of this system:

- (1) *The volume inspection requirements of ASME Sec. XI are met.*
- (2) *Positioning by orbits and the arm ensures good reproducibility of data.*
- (3) *Easy attachment/removal of the orbits, driving unit etc. enables the reduction of radiation exposure.*
- (4) *The multiprobe has been successfully adopted for the three angle detection (0°, 45°, 60°) conducted at the same time, in compliance with required standards.*
- (5) *The turntable is placed on the point of intersection of the longitudinal and peripheral orbits over a pressure vessel body, enabling flaw detection along both weld lines.*
- (6) *A microcomputer has been introduced for distance/amplitude correction and greatly facilitates adjustment.*
- (7) *Data processing is performed off-line and even when certain detection is underway, different data computation for analysis can be operated. Adding the data storage unit is an option, and the inspection for two portions, such as a body and piping system, is available simultaneously.*

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JAPAN

NEW URANIUM ADSORBENT RESEARCH, DEVELOPMENT

Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 78

[Text]

The Government Industrial Research Institute, Shikoku has engaged in the research and development of adsorbents for collecting uranium from sea water, and has recently developed a flock type titanium-activated charcoal composite adsorbent and an amidoxim type chelate resin adsorbent.

1) Flock Type Adsorbent

The Institute has already developed a powdered titanium-activated charcoal composite adsorbent and has succeeded in collecting uranium, in the form of yellow cakes, from natural sea water. However, the drawback to this method was the collection efficiency. This was greatly decreased if the adsorbent was used in grain form, which is easy to use, instead of powder.

The Institute has solved this problem by turning the powdered adsorbent into flock, using polyacrylic acid hydrazide (PAH). Adding 0.5% PAH to the composite adsorbent causes more than 70% of the adsorbent to turn into flock with a grain size of over 0.1mmφ. The speed of the flock adsorbent adsorbing uranium is 0.16mg g⁻¹-Ad, comparable to that of the powdered adsorbent. The adsorption performance of the flock adsorbent usually depends on that of the powdered adsorbent used as the flock adsorbent material. Thus, the flock adsorbents can be improved by using higher performance material. The flock adsorbent has a settling speed of over 12m per hour and can be applied to sedimentation separation type and fluidized bed type uranium collection systems.

2) Amidoxim Chelate Resin Adsorbent

Recently, a new chelate resin capable of selective adsorption of heavy metallic ions has been developed by Prof. Egawa, et al. of Kumamoto University. The resin was synthesized by allowing hydroxy amine to react with a copolymer of acrylonitril and divinyl benzen.

The Institute attempted to apply this resin in collecting uranium.

The resin, however, had the disadvantage of a low affinity with water, making it difficult to increase the uranium adsorption speed. The Institute has now, succeeded in synthesizing a resin using tetraethylene glycol dimethacrylate (TEGDM) as a hydrophilic cross-linking agent. This resin has a higher uranium adsorption speed and larger uranium adsorption capacity, than conventional titanium adsorbents, 0.5mg g⁻¹-Ad per 10 days and 3mg g⁻¹ per 150 days, respectively. Uranium adsorbed by the resin was separated by nearly 100%, at room temperature for 30 minutes, with 1N acid. In addition, the resin, after repeated service, showed scarcely any decrease in adsorbing capacity. The resin is applicable to column adsorption through a fluidized bed system. Further research and development is being carried out at the Tokyo University Production Technology Laboratory and the Mitsubishi Kasei Industries Central Laboratory.

3) Amidoxim Type Fibrous Adsorbent

The Government Industrial Research Institute, Shikoku, has also developed a fibrous adsorbent by introducing an amidoxim base into acrylic fibers. Fibrous adsorbents can be manufactured into various products, including nets and belts. Thus, it is expected that the new uranium collection systems, which move adsorbents without moving the seawater, will be established.

The newly synthesized amidoxim fiber has a very high uranium adsorbing speed, around 10-20 times that of conventional titanium adsorbents. Tests using natural seawater proved that the fiber adsorbed uranium at a rate of 1.8mg-g⁻¹ for 10 days or 4.6mg-g⁻¹ for 50 days. The fiber still requires some improvement in its strength and endurance, though it is readily stripped of uranium.

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JAPAN

ASAHI CHEMICAL GETS TO USE GOVERNMENT NUCLEAR FUEL

Tokyo JAPAN ECONOMIC JOURNAL in English 3 Feb 81 p 12

[Text]

The Science & Technology Agency has allowed Asahi Chemical Industry Co. to use nuclear fuel at its planned uranium enrichment facility at Hyuga City, Miyazaki Prefecture.

The permit paves the way for Asahi's attempts to win the prefectural government's agreement on constructing its model plant based on chemical (ion exchange resin) enriching process. The company expected it can shortly start construction.

The plant, it is hoped, will confirm the chemical route's enriching feasibilities so that a commercially-sized plant can eventually be built. It will become the second Japanese enriching technology along with the gaseous centrifuge process being pursued by the Government's Power Reactor and Nuclear Fuel Development Corp.

Asahi developed basic know-how by taking advantage of the principle that two uranums with different chemical characteristics, when present simultaneously, help the useful uranium (U-235) move toward

one uranium. The principle was discovered about 30 years ago.

The model plant is intended to confirm the economic feasibilities and technical soundness of Asahi's basic process. It will consist of four columns, measuring 2.5 meters in height and 1 meter in diameter, for the chemical exchange reaction.

The product will be uranium enriched 3 per cent, which is good enough for consumption by light water reactors. When fully utilized, the test facilities can produce about 500 kilograms of the enriched fuel a year.

Asahi is scheduled to complete the plant by the spring of 1983 for operation until fiscal 1985. Of the total estimated cost of ¥12 billion, two-thirds are being financed by the Science & Technology Agency and Ministry of International Trade & Industry.

The STA approval for nuclear material use was granted largely because it involves no radioactive waste problems. About 5 tons of natural uranium will be consumed annually.

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JAPAN

LDP URGED TO SEEK SUPPORT FOR NUCLEAR PLANTS

Tokyo MAINICHI DAILY NEWS in English 14 Feb 81 p 5

[Text]

The ruling Liberal-Democratic Party (LDP) should caravan throughout the country to encourage unionists, consumers and local leaders to support the government's nuclear power projects to a greater degree, an LDP member proposes.

The private proposal, made by Tsunezo Watanabe, former parliamentary vice minister of international trade and industry and secretary general of the LDP's new task force for promoting nuclear power, was contained in a nine-point recommendation disclosed Friday.

In the recommendation, to be submitted for consideration to the task force's first session next Tuesday, Watanabe aims at putting back on the track derailed nuclear power projects within two years.

The power site construction promotion headquarters should carry out a powerful national movement with local administrators, entrepreneurs and residents to remove hindrances to their efforts and to defend the future livelihood of people, he proposes.

More concretely, he proposes to send caravans with such a mission to Ishikawa, Mie, Yamaguchi and some other prefectures where nuclear power projects are an issue.

The headquarters should also try to improve safety-checking systems at nuclear power plants at the same time, Watanabe says.

The proposed action policies are likely to arouse arguments among local governments and residents who still remain concerned over the safety of nuclear power stations, and draw new criticism from antinuclear campaigners.

The nation now depends on nuclear power for about 12 percent of its energy production.

The government hopes to increase the dependence rate to around 23 percent in a decade by building or planning 14 more nuclear reactors by 1985.

But, persistent opposition from some people has not only blocked the state's efforts, but has also undermined them.

The government set the target for nuclear power output by 1985 at 60 million kilowatts 10 years ago.

It was reduced to 49 million kilowatts five years ago and further to 30 million kilowatts two years ago.

The government party is thus keen to repromote its energy plans toward greater reliance on nuclear power, possibly timing such campaigns with local elections.

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JAPAN

EFFORTS TO REVIVE INTRODUCTION OF CANDU REACTOR NOTED

Tokyo DAILY YOMIURI in English 13 Feb 81 p 5

[Article by Mikio Kuwamori]

[Text]

Moves for introducing the CANDU nuclear reactor from Canada have been reviving in Japan because of a complete change in the circumstances surrounding the reaction to introduction of the CANDU over the past two years.

The semigovernmental Electric Power Development Company and the International Trade and Industry Ministry (MITI) started moves in favor of introducing the CANDU reactor five or six years ago, but the Atomic Energy Commission, which holds a decisive power over Japan's atomic power policy, decided in August 1979 to shelve the introduction of the reactor.

When International Trade and Industry Minister Rokusuke Tanaka visited Canada this January, however, he told Prime Minister Pierre E. Trudeau and other Canadian officials that he would seriously study introduction of CANDU, suddenly bringing the issue into the spotlight once again.

In a press conference after his return to Japan, Tanaka said introduction of CANDU should be studied from a wider perspective as part of Japan's economic security. This remark made the issue more realistic.

As to the question whether an influential cabinet minister can easily reverse the decision made two years ago, a knowledgeable source said that the Atomic Energy Commission will move toward introduction of CANDU after its chairman, Suzumu Kiyonari, is replaced by Takashi Mukai-bo, who has just retired as president of Tokyo University.

As a matter of fact, MITI and Electric Power Development Company did not give up introduction of CANDU when the commission made the decision against it. They have been steadily taking step toward its eventual introduction.

Japan's nine electric power companies, which used to take a negative attitude toward introduction of CANDU, have now adopted a policy of diversifying nuclear reactors and become flexible about the issue.

The time to introduce CANDU is now believed to be ripe since a summit of industrialized democracies will be held in Ottawa. During the past few years, Canada has also created circumstances that will make Japan introduce CANDU. Canada, for instance, has indicated that supply of its crude oil will

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be tied with Japan's introduction of CANDU.

The position of those who oppose introduction of CANDU has been weakened in political and business circles and in the press. Toshiwo Doko, who opposed CANDU introduction two years ago, has resigned as president of the Federation of Economic Organizations (Keidanren) and been succeeded by Yoshihiro Inayama, who supports the introduction. The Suzuki cabinet seems to have been influenced by former prime minister Kakuei Tanaka, who reportedly was in favor of the introduction.

The basic reason for these changes in the situation is presumably an alteration in the people's opinion about the energy issue.

Two years ago people's opposition to nuclear power plants mounted extraordinarily due to an accident at the nuclear power plant on Three Mile Island and other incidents. Laymen as well as experts warned against an easy-going introduction of CANDU in this country.

Between the summer and autumn of 1979, however, the second oil crisis occurred, pushing up crude oil prices abnormally. The Iran-Iraq war and other factors added to uncertainty. Under these circumstances, calls for stable supply of energy resources increased.

The advantages of introducing the CANDU reactor

include diversification of risk by breaking away from the nuclear power policy depending solely on the US and supply to Japan of Canadian crude oil in return for the adoption of the reactor. Access to Canadian resources will lead to Japan's overall security.

Electric Power Development Company points out that the CANDU reactor itself is advantageous in that uranium enrichment is not necessary because natural uranium is used and its operation rate is higher than the light water reactor that Japan has already adopted.

But experts still question the safety of CANDU. According to sources, the Atomic Energy Commission has indicated that permission for only a research reactor, instead of a commercial reactor, for the time being will not present any problem.

Japan is forced to depend on atomic power for its alternative energy and to tackle the task of diversifying energy supply sources. It will, therefore, be necessary to confirm the safety of CANDU with a research reactor.

At a time when many municipalities are opposing construction of atomic power plants in their communities, a mood to welcome CANDU is prevailing among people on the Shimokita peninsula in Aomori-ken, the proposed site for the reactor.

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JAPAN

BRIEFS

NEW TRITIUM SEPARATION METHOD--Entrusted by the Power Reactor and Nuclear Fuel Development Corp., the Institute of Physical and Chemical Research Dealing with the development of tritium removal and recovery from heavy water, has succeeded in cooperation with Sumitomo Electric Industries and others, in developing a new catalyst suitable for tritium separation together with a new type reaction column. This is a breakthrough to materialize a "chemical conversion method" as a technique for tritium separation. The column is expected to provide greater control of radioactive tritium released from nuclear power plants and reprocessing facilities. Moreover, the institute has recently conducted basic experiments of a laser separation method with success; by combining both techniques in the future, near-perfect elimination of tritium from heavy water can be achieved enabling not only reduced discharge to the environment but providing tritium fuel for nuclear fusion. The chemical conversion process, successfully demonstrated by the institute, uses the principle that when a gas connected with deuterium and tritium is brought into contact with heavy water, tritium concentrates in the liquid under a Pt catalyst. [Text] [Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 48]

NUCLEAR AIDS FOR DEVELOPING COUNTRIES--The government has announced its policy to tackle seriously nuclear aid and cooperation with developing nations, mainly in Asia-Pacific districts. Comprised of top nuclear leaders from both public and private sectors, the "Nuclear Cooperation Meeting for Developing Countries" (tentative name) and other bodies will soon be organized to discuss several support measures. The government's intention is that the promotion of assisting developing nations with nuclear energy development will contribute to the nuclear non-proliferation setup as well as to provide for peaceful nuclear use, all of which are stepping stones to successfully lead negotiations such as the Japan-U.S. nuclear energy talks that start late this year or early next year. Japan's joint nuclear energy efforts have until now been centered on those of the Western nations. In August 1978, however, Japan joined IAEA's "Regional Cooperation Agreement on research, development, and training for nuclear science and technology" (RCA). Since then, Japan has been collaborating positively with Asian RCA member countries in the fields of isotopes and irradiation studies etc. Specifically, it decided this August to provide 236,000 dollars for food irradiation research in which 10 nations are expected to participate. The amount is almost equal to the total funds needed to initiate aid for the developing nations. [Text] [Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 48]

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NUCLEAR POWER PLANT DESIGN--The concept of an underground nuclear power plant is under consideration by MITI and others. This new construction technology will provide plant safety along with easier siting, and the ministry is to work out the conceptual design of an underground power station within this fiscal year. In addition, MITI will shortly begin a siting survey for an underground plant in the coastal region of Iwate Pref., in partnership with the Electric Power Development Co., Ltd. and Tohoku Electric. Such type of plants abroad are being planned for one (285MW) in France and one (68MW) in the U.S. MITI attempts to build a moderate size underground plant in the 200--400MW range. To this end, the Subcommittee on Siting for Underground Nuclear Power Plants (provisional name) will proceed with the conceptual designing, economic and technical feasibility studies, coupled with the Iwate coastal area siting investigation. [Text] [Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 48]

JOINT LONGEVITY--Okuda Sogabe Co., Ltd., a manufacturer of flexible equipment has succeeded, in association with Hitachi Ltd., in developing stainless steel flexible joints for reactor containers in order to further improve the safety of BWR's, and the joints have been adopted for the Unit 2 reactor in the Fukushima Daini (II) nuclear power station of Tokyo Electric. The diaphragm floor for a reactor container is more than 20 meters across; when a nylon seal bellows is mounted along its periphery, the bolts needed reaches 1,000 and the bellows requires replacement about once every 3 years because of the nylon's life. The newly-developed stainless steel joint of 3 mm in thickness is prepared by factory- and site-welding, which enables the use of the world's largest, 27m dia., 80m long flexible joint for the reactor container. Its service life has been extended up to 40 years, 12 times that of existing models. Successive unit 3 and 4 of Fukushima II plant will employ the equipment in addition to the Tokyo Electric Kashiwazaki reactor, seemingly encouraging the spread of the utilization among other nuclear power facilities. [Text] [Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 48]

INSPECTION OF NUCLEAR POWER PLANTS--The Ministry of International Trade and Industry (MITI), responding to the growing public concern to call for safety assurances regarding nuclear power stations, has agreed basically, to establish an independent nuclear inspection body as well as to train and strengthen qualified inspectors, in order to enhance a regular check-up system for power plants. Based on the policy, the Heat Engines for Power Generation Association, a non-profit foundation, which has been performing the welding inspections of thermal and nuclear power equipment, has been reformed and expanded to create the "Nuclear Power Inspection Center" within the institute, recruiting about 50 inspection personnel before service start-up. MITI intends to revise regulations to pave the way for full-fledged independent execution of periodic inspections by the third party organ. [Text] [Tokyo TECHNOCRAT in English Vol 13 No 12, Dec 80 p 48]

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FRANCE

BRIEFS

NUCLEAR AGREEMENT DANGER--The SDECE has warned the French Government concerning the consequences of the agreement reached between Helsinki and Paris for the exchange of information relative to safety in nuclear power stations. According to the French intelligence service, the Soviets could in this way gain access to manufacturing techniques that they have had difficulty in mastering and which would then enable them to compete with France for [nuclear reactor] markets. [Text] [Paris VALEURS ACTUELLES in French 9 Feb 81 p 16]

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ITALY

NUCLEAR SAFEGUARDS PLANNED FOR LA MADDALENA, SARDINIA

Milan IL MONDO in Italian 23 Jan 81 p 19

[Article by Cristina Jucker]

[Text] The first phase in the installation of the system in question will get underway in spring; it is anticipated that by summer it can already be in operation. We are speaking of a new control system, or rather a monitoring system, for radioactive waste which, for the first time in the history of the Mediterranean, will be installed at various points of the archipelago of La Maddalena, in Sardinia.

In fact, pursuant to an agreement signed in 1972 by Giulio Andreotti, defense minister at the time, and the United States Government, part of the island of San Stefano, included in the territory of the Italian Navy, was conceded to the American Armed Forces. The U.S. forces use this base to moor a mother ship capable of providing ordinary or extraordinary maintenance to the large number of nuclear-propelled submarines plowing through the Mediterranean waters these days. And it is during maintenance that the greatest risks are incurred.

The new system, costing about 0.5 billion lire, is being financed by the Ministry of Health. The engineering, manufacture and installation have all been assigned to Sepa, a Turin company of the Fiat group. The system planned for La Maddalena consists essentially of seven peripheral analysis stations, that is, sounding stations, located at various points of the archipelago (three in San Stefano, two in Caprera, one in Palau and one in La Maddalena) which, every 10 seconds, collect samples of water or air and send the pertinent information to a processing center located in La Maddalena; here the information is verified and analyzed according to previously established parameters.

In theory, all this is expected to safeguard the lives of the nearly 15,000 inhabitants of the archipelago and the many summer tourists. In reality, serious problems still remain to be solved. For one thing, we are still waiting for financing in the amount of 250 million lire by Minister Aldo Aniasi to cover the costs of administration and, especially, the personnel required to monitor the alarm signals (for example, there are no plans for a night shift). But what is more serious is the lack, or rather the disregard, of an emergency plan to accompany a possible alarm. In fact, the Ministry of the Interior, through the prefect, maintains that such a plan does exist but that neither the communal and provincial council nor the people are aware of it.

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